REMARKS/ARGUMENTS

Claims 1-10, 12, 14-17, 19, 20, 22, 24 and 27 are pending in this case. In the Office Action mailed October 31, 2003, all pending claims 1-17, 19-24 and 27-31 were rejected. Claim 1 has been amended to correct an informality.

Claims 1-10 stand rejected under 35 USC 103(a) as being unpatentable over Fox et al (US Patent No. 6,682,772) in view of Mochizuki et al (US Patent No. 6,190,957).

Claims 12, 14-17, 19, 20, 22 and 24 stand rejected under 35 USC 103(a) as being unpatentable over Fox et al (US Patent No. 6,682,772) in view of Mochizuki et al (US Patent No. 6,190,957).

Claim 27 stands rejected under 35 USC 103(a) as being unpatentable over Fox et al (US Patent No. 6,682,772) in view of Mochizuki et al (US Patent No. 6,190,957).

The rejections under 35 USC 103(a) are respectfully traversed.

According to the present invention as claimed, a perovskite phase can be obtained through a first anneal and, thereafter, a top electrode layer, covering the layer of ferroelectric dielectric material is formed. Top electrode formation is followed by a second anneal. Through the second anneal, crystallization of the layer of ferroelectric dielectric material can be completed.

The second anneal is performed by rapid thermal annealing, and a second annealing temperature is adjusted higher than the first annealing temperature.

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The invention as claimed provides improved ferroelectric performance, and highly integrated ferroelectric capacitors having excellent performance characteristics can be obtained.

On the other hand, Fox et al teaches that a first anneal (500 to 650 °C) and a second anneal (700 to 750 °C) are performed after forming a PZT layer. The PZT layer is crystallized after the two anneals are formed, and then the top electrode is formed.

Mochizuki et al teaches formation of a bottom electrode and ferroelectric layer followed by an RTA anneal at 800 °C, formation of a top electrode, and then a conventional anneal at 600 °C is performed.

The rejections under 35 USC 103(a) are respectfully traversed because the teachings of Fox et al and Mochizuki et al cannot be combined. Secondarily, if the teachings of Fox et al and Mochizuki et al are arbitrarily forced to be combined through a "pick and choose" method of selecting various components from each of the references, this does not provide the method of the present invention as claimed.

Fox et al and Mochizuki et al both teach "stand alone" methods for providing a ferroelectric capacitor. The method taught by Fox et al chooses to provide a first anneal and a second anneal between the formation of the ferroelectric layer and formation of the top electrode. There is no suggestion or desire in Fox et al to split up the two anneals so that the first anneal is performed between the formation of the ferroelectric layer and the formation of the top electrode layer, and then performing the second anneal after formation of the top electrode.

Similarly, Mochizuki et al chooses to provide an RTA anneal between the formation of the ferroelectric layer and the top electrode layer. A

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second anneal at a temperature lower than the first temperature is then performed after formation of the top electrode layer. There is no suggestion or desire in Mochizuki et al to use the anneals or temperature protocol developed in Fox et al. The suggested use of an RTA anneal and annealing temperatures in Mochizuki are tailored to provide optimum performance for the method as taught.

If the two teachings of Fox et al and Mochizuki are forced to be combined, despite the fact that there is no suggestion for combining these references, the method of the present invention is not provided.

Using Fox et al as the primary reference, in combination with the teachings of Mochizuki et al, a method of forming a ferroelectric capacitor would result as follows: forming a bottom electrode layer, forming a ferroelectric layer, performing a first RTA anneal at 800 °C, performing a second anneal at 600 °C, and then forming a top electrode layer.

The above-hypothesized combination method is completely different than the method claimed in the present invention. Regarding claims 1 and 27, specifically, note that the first temperature is higher than the second temperature, and not lower as claimed. (Second temperature is claimed to be higher than the first temperature.) Secondly, note that both of the anneals are performed between the formation of the ferroelectric layer and the top electrode, and not split as in the present invention.

Thus, claims 1 and 27 are deemed to be patentable over the combination of the Fox et al and Mochizuki et al references for the reasons given. Fox et al and Mochizuki et al are not combinable since there is no suggestion in the references for the hypothesized combination, and further, if the references are combined they do not provide the claimed method.

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Using the two references to selectively choose features of each using the present invention as a roadmap is respectfully traversed and prohibited by case law.

With respect to claim 12, this claim is also deemed to be patentable over the combination of the Fox et al and Mochizuki et al references for the reasons given. In addition, there is no teaching in Fox et al or Mochizuki et al for "the oxygen having a second partial pressure less than the first partial pressure and performed after the step of deposition of an electrically conductive top electrode layer" for two similarly situated anneals being performed before and after formation of the top electrode layer as claimed.

It is deemed, therefore, that claims 1, 12 and 27 are allowable as containing bona fide limitations that are neither taught nor suggested by the theoretical combination of Fox et al and Mochizuki et al. Claims 1, 12 and 27 are thus deemed to be allowable under 35 USC 103(a). The remaining pending claims are deemed to be allowable as depending from an allowable base claim.

No fee is believed due for this submittal. However, any fee deficiency associated with this submittal may be charged to Deposit Account No. 50-1123.

Respectfully submitted,

7/21, 2004

Peter J. Meza, No. 32,920
Hogan & Hartson LLP
One Tabor Center
1200 17th Street, Suite 1500
Denver, Colorado 80202
(719) 448-5906 Tel
(303) 899-7333 Fax

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